DEVELOPMENT AND RE-ESTABLISHMENT OF BREAST MILK BY USE OF DR. ABT'S ELECTRIC BREAST PUMP

A PRELIMINARY REPORT *

By EARL M. TARR, M. D., *Los Angeles*

Indications for and results obtained by the use of the pump both in developing and re-establishing breast milk.

The importance of emptying the breast as a sure method of prolonging the milk supply is strongly emphasized.

Several illustrations.

Healthy discussion by A. J. Scott Jr., Los Angeles; Angus B. Cowan, Fresno; Clain F. Gelston, San Francisco; Robert G. Sharp, San Diego.

MY THEORY that the new-born infant is practically never able to completely empty a full breast and that a breast will function in direct proportion to the amount of stimulation which it receives, is reasonable and will eventually be accepted as a fact. When this point is definitely settled and its significance fully appreciated, more consideration will be given the mechanism of nursing and more infants will be given breast milk over a much longer period than at the present time.

Development of breast milk should begin THE DAY THE BABY IS BORN. There can be no question regarding the logic of this statement, and yet very few of us actually begin our real work until there is a definite shortage of food. To presume that the infant is going to be able to furnish enough stimulation to start a breast going properly and keep it functioning satisfactorily for seven or eight months simply means that *weaning* will automatically take place long before it should. It seems advisable, therefore, to study the infant at breast, and if he is unable to completely empty the breast at each nursing, then added stimulation may well be considered.

The late Dr. Sedgwick did more, perhaps, than any other one man to stimulate us to thought and action regarding the best means of developing and maintaining breast milk. Dr. Abt has always taught that thorough emptying of the breast at each nursing is absolutely necessary if we hope to keep the organ functioning adequately throughout the normal period of lactation. I believe that I am one of the first to specifically state that practically no new-born infant is PHYSICALLY able, during the first few weeks of life, to empty a breast, and that added stimulation should be given the breast *as soon as the baby is born.*

"Expression," as advocated and taught by Sedgwick, has been productive of amazing results, and thousands of infants have been saved because proper and sufficient food was made possible for them. Ulysses Moore, in his work in France and Belgium, and Portland Oregon, clearly demonstrated that development and re-establishment of breast milk was the most practical way to supply safe food for the starving infants under his observation. In private and clinic practice in this country, he insists that "all healthy mothers can keep their breast milk indefinitely if the breasts are properly stimulated."

The electric breast pump which Dr. Abt has perfected will not, in my opinion, discourage the practice of hand expression. Indeed it will serve to lay the foundation and pave the way so that expression will be more generally practiced. This pump is a mechanical contrivance, electrically driven, and operates on the same principle as the milking machine used in the dairy. This electric pump will be found far more useful in the maternity division of the hospital than elsewhere, and I feel reasonably sure that it should be used there rather than sold to the mother for home use. Hand expression can be done by the mother after she leaves her lying-in bed, and will be found altogether satisfactory. Time will not permit detailed description of the pump. During the past year I have used it extensively and have studied results impartially. I must thank the obstetricians for their excellent co-operation without which even a preliminary report at this time would be impossible.

ADVANTAGES OF THE ELECTRIC BREAST PUMP

1. The pump is safe and easy to operate, and a breast may be emptied in three or four minutes.

2. One pump will do the work of six nurses.

3. Improper technique on the part of inexperienced nurses who practically never "express" properly will be largely overcome.

4. Engorged breasts, in which the nipple is short and difficult of manipulation, can be relieved or emptied quickly and without pain. The relief to the mother is immediate and complete.

5. Premature infants will be assured of their intended food, if the pump is used on the mother until her milk supply is fully established.

6. When used on the mothers in a maternity ward, an abundance of breast milk will always be on hand for delicate or premature infants.

7. The use of the pump will relieve mothers of the tedious, tiresome, and often painful method of hand expression which is still practiced in some hospitals by the sick mother at the request of her physician.

8. Breast stimulation can be started as soon as the baby is born, and once the mother realizes that her babe cannot give sufficient stimulation, she will readily see the logic of expression and will be eager to practice it after returning home.

9. Fissured nipples heal promptly when the pump is used and the infant kept from the breast for a short time.

IMPORTANCE OF PROPER MILKING TECHNIQUE

It is to be remembered that mothers are entitled to all the consideration we can give them, and their mental, as well as physical, comfort should be carefully planned. You will find, when you first use the pump, that in some patients curiosity, timidity, and actual fear will be encountered, and these conditions must be carefully eliminated.

Some of the important points in connection with successful use of the pump are as follows:

1. Assure the mother that the pump will not hurt when applied to her breast.

2. Allow her to experience the sensation of suc-

* From the Department of Research the Anita M. Baldwin Hospital for Babies.

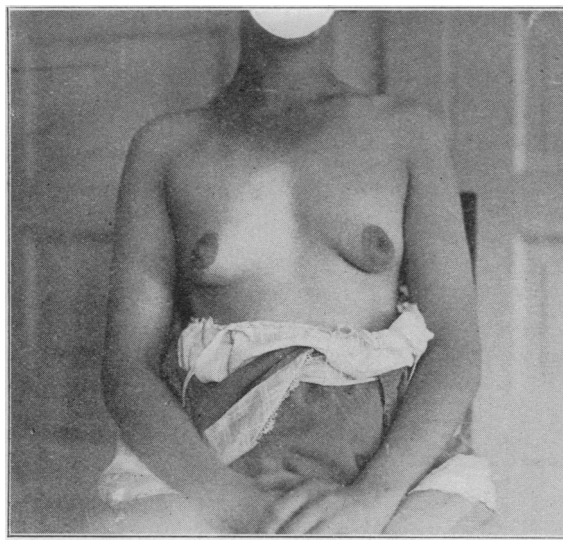

Figure I.—Re-establishment. Dry breasts for nine weeks. Dr. Abt's electric breast pump used forty times before results were assured.

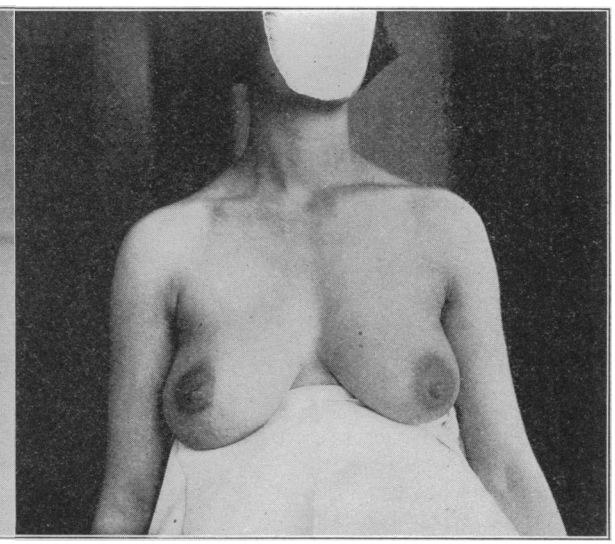

Figure II.—Same case one month later, at which time breasts were producing 20 ounces daily. Pump used 209 times.

tion by holding the shield over the palm of her hand. This will give her an exact idea of just how it will feel to the breast.

3. Always start with the suction at zero and very gradually increase. This is necessary to "draw out" the nipple and when slowly and painlessly done will avoid frightening the mother. As she becomes accustomed to the sensation, the vacuum may be increased.

4. Careful selection of a proper shield, or glass nipple, is essential. Long nipples require a larger shield than short nipples, and it is necessary to apply the shield to the nipple in such a way that the openings in the nipple do not come up against the sides of the glass shield. This would, of course, shut off the free flow of milk and would give discouraging results.

5. Forbid demonstrations on a patient until she is thoroughly familiar with the pump.

6. The container which is to receive the milk as it escapes through the rubber valve must be large enough at the mouth to allow the valve to empty freely. A clean medicine glass or a clean glass tumbler is satisfactory. The ordinary small-necked nursing bottle is the container we use.

DEVELOPMENT CASES—GROUP 1. SIXTY-TWO CASES

Sixty-two studies make up this group. Of this number, there were forty-eight spontaneous deliveries, one breech, one version, eight low forceps, and two Caesarian sections. The birth weights ranged from 5 pounds 3 ounces to 10 pounds 9 ounces, and the number of males happened to be exactly the same as the females. All of these babies left the hospital weighing more than their birth weight. (This is due, in part, to the fact that none of them were allowed to experience the usual "physiologic loss" for more than sixty hours). They were all given a 15 per cent carbohydrate solution until the milk flow was well established, were nursed at three and four-hour intervals, and were also given the milk obtained by pumping. No nursing period was for longer than twenty minutes and, when possible, we kept them at the breast not more than ten minutes.

Among the mothers were four who had never been able to nurse previous children. In spite of their belief that it was utterly useless to attempt to develop milk, they all became excellent producers and went home with more milk than the infants could use. Three of the mothers gave a history of breast abscesses at previous times, and the breasts had been given up as worthless. All of these mothers developed quite all the milk they needed.

Thirty-six mothers were primiparae, and twenty-six were multiparae. Owing to the fact that they were the patients of several doctors, it was impossible to handle all of them the same. The pump was used not less than five times daily nor more than seven times, and it was used regularly from the *day of delivery to the last day in the hospital.*

COMMENT

The results were uniformly good. All breasts responded well, but some were slower than others. No sore breasts or breast abscesses developed. Primiparae, in this group, did a little better than multiparae, and I lay this principally to the fact that these women are often in a better physical state than women who have borne several children. This is by no means a rule, but simply an observation. Practically all of these patients have been under observation during the past six months. Clinic cases have been more difficult to follow than private cases, but those who have reported regularly have done better than we had expected. So near as we can learn from the data obtained, about 90 per cent of these babies have had breast milk throughout their first six months. We hope to follow these cases for another three or four months, and then draw our final conclusions.

RE-ESTABLISHMENT CASES—GROUP 2. SIXTEEN CASES

Naturally, the re-establishment of breast milk is far more difficult than the comparatively simple task

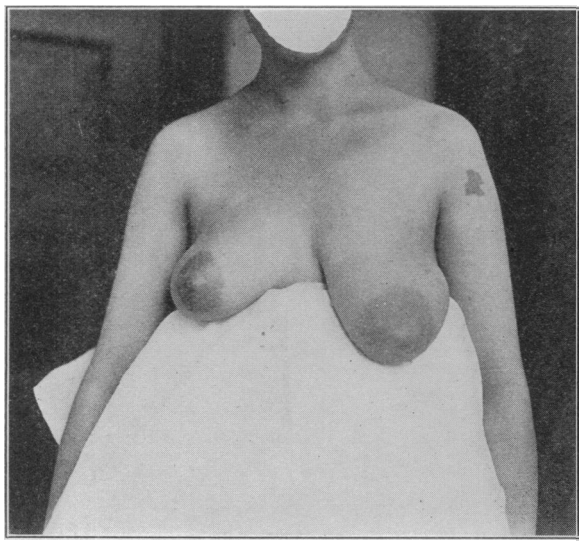

Figure III.—Development. Right breast nursed by infant. Left breast pumped with Dr. Abt's electric breast pump. Infant one month old.

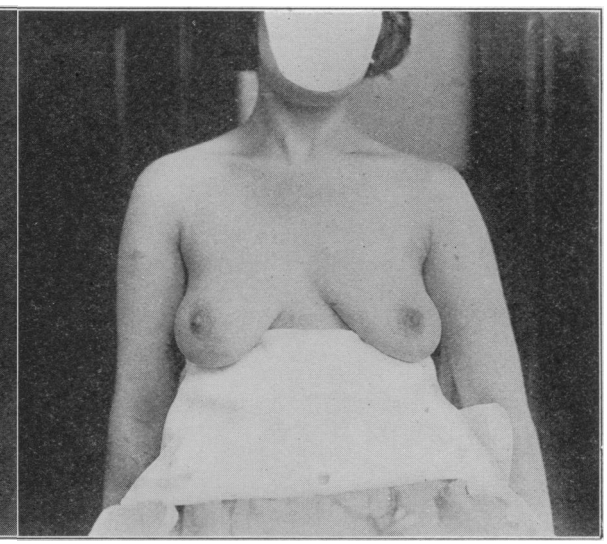

Figure IV.—Appearance of breasts of primiparae after pump used two weeks to develop milk. First picture about like Figure I. Pump applied eighty times.

of its primary development. Most of the mothers in this group had been dry, or practically so, from two to nine weeks, and the electric pump was used, not because I consider it greatly superior to hand expression, but because it would do the work much quicker. These women are all difficult psychological problems and require careful management. The chief difficulty is that most of them refuse to believe that the dry breast can be made to resume function and this, of course, must be definitely settled in their minds before any results can be expected. Detailed directions regarding their daily mode of life and what is expected of them must be outlined and explained with considerable minutia. They are taught how to use the pump and are asked to report each twenty-four hours.

The shortest time necessary to re-establish milk in this group was nine days. This woman had been dry for five weeks. The pump was used six times in each twenty-four hours, and on the second day she got a few drops. This encouraged her, and the belief on her part that she was going to be successful was the best galactagog imaginable. She went right up to 16 ounces in the first week, and a week later was producing 22 ounces daily.

The longest time required to re-establish milk was thirty-eight days. This woman had been dry for ten weeks, but she worked the pump faithfully and on the sixth day was rewarded with a few drops of watery fluid. She had applied the pump just forty times during the week. Her production then became regular but very slow up to the twenty-eighth day, when she obtained 12 ounces in six pumpings. On the thirty-eighth day she got 21 ounces and kept this amount during the next four months.

SUMMARY

This is a preliminary report of my experience with Dr. Abt's electric breast pump in developing and re-establishing breast milk. At present I am encouraged and rather enthusiastic, and believe that the pump will prove exceedingly valuable in the maternity hospital. Certainly, it is worthy of trial because it does no injury to a breast and, in my experience, has helped develop and re-establish milk easier and more promptly than hand expression.

2007 Wilshire Boulevard.

DISCUSSION

A. J. Scott, M. D. (1501 South Grand Avenue, Los Angeles)—Doctor Tarr has presented his subject well. It takes an enthusiast to take a subject as this, and make it interesting and a stimulus to others to try. Doctor Abt has offered in this electric pump an easy as well as a simple method of milk expression. It would not be practical to use it in the home unless it could be rented from the physician, on account of the initial expense. It is a suitable piece of apparatus to use in any and all hospitals, but it must be used correctly to get results, and intelligently so as not to do damage, as is possible in the hands of an unskilled person. One nurse should have charge of the technique, and should do all the training of the nurses who use the machine. It is surprising what can be done in re-establishing or stimulating milk-flow. This machine convinces mothers, as well as doctors, that the new-born does not empty the breasts at feeding time.

It is not necessary to comment on the fact of the necessity of emptying the breasts to keep up the necessary milk supply. For the premature this machine is a great boon, for it does give him the so essential breast milk, and at the same time, the psychic effect on the mother is good.

We need among our obstetricians, as well as general men, more persistent and insistent teaching of mothers of the necessity of breast-feeding.

I have seen the result of this machine and have been well pleased, but my personal use of it has been very limited. The manual expression is used by me constantly, and I have had very good results.

Angus B. Cowan, M. D. (Fresno, Calif.)—The normal mammalian breast within certain definite limits will respond to the demands made upon it. The maximum output of milk is attained when the demand made upon the breast is greatest. A breast with an output of less than its maximum capacity may have the output increased when the demand is augmented. A breast with a capacity for larger output will automatically regulate the output to meet a diminished demand. An increased demand in itself will not cause an increased output in a breast functionally inefficient through other factors. Many such breasts exist.

The above seem to be established facts long known in the field of animal industry. Doctor Tarr's experiments give further proof of the wisdom of completely emptying the breast so that the maximum supply may be obtained. The contention that supplemental expression be adopted

Figure V.—Expressing milk from breast. With the thumb at upper margin of areola above and tip of index finger at areola below, a "together" movement is made which forces milk out of the ampoulae. Please notice that thumb and finger are properly placed and do not "hug" the nipple.

in all cases where the breast, after nursing has not been completely emptied, need not be conceded. Given a healthy vigorous infant and a breast that will functionally operate, it is held that sufficient stimulus to provoke a satisfactory output will be provided as the child grows older and his food demands become greater. This is well proven in Doctor Tarr's re-establishment cases. In the case of premature or delicate infants, where efforts at nursing are feeble, or in the case of mothers who give a previous history of having been unable to nurse their young, the point is well taken and such procedure held advisable.

The contention that supplemental expression should begin immediately after the birth of the baby needs additional proof before being attempted routinely. During the time of engorgement, when the breasts are swollen and painful, it would seem that utmost gentleness should be used, and further experiments are needed to prove whether it is better to begin stimulation at this time or await the period when the normal flow begins.

CLAIN F. GELSTON, M. D. (380 Post Street, San Francisco)—The great value of observations such as are presented by Doctor Tarr rests in the fact that a practical and easy method of stimulating the flow of breast milk is offered. The difficulties encountered in manual expression, in spite of the years of work of Sedgwick and his coworkers, have prevented a really conscientious effort on the part of physicians throughout the country to apply his teachings.

Proof is certainly no longer needed that it is essential that a breast be emptied for preservation of an appreciable flow of milk. The simple method, as devised by Doctor Abt, is a great step in popularizing a maneuver having the greatest of influence on preventive pediatrics.

ROBERT G. SHARP, M. D. (1000 Watts Building, San Diego, Calif.)—As a boy on a farm, I am sure that I earned more beatings for not "stripping" the family "Bossy" than for any other sin of omission. My father literally pounded this principle into me: "In order to maintain a good milk supply it is necessary to completely empty the udder at each and every milking." While in France with Sedgwick, he used to slap me on the shoulder and say: "Sharp, don't ever make the mistake of trying to stuff your mothers in order to make more milk. It only makes them fat and disgusted. Strip the breasts after each nursing, and you stimulate an increased milk supply." Again a principle was being pounded into me.

Now comes Abt with his electric breast pump and offers the method de luxe for breast stripping. Dr. Tarr has clearly and forcefully set forth the uses and advantages of this breast pump. His contention that the premature and the new-born are practically never able to empty a full breast is undoubtedly correct. To these two types may also be added the weaklings and the lazy of whatever age. That we all recognize these facts and that we all agree with Tarr, is probably true. Is it not just as true that all of us are not at all times as diligent as we should be in our efforts to develop and maintain, and especially to re-establish an adequate supply of breast milk for the infant who cannot or will not develop his own? It is so often a useless struggle to induce the mother to strip her breasts after the infant has nursed, and so much easier to put the babe on a complemental formula which he likes, takes well, and upon which he commences an immediate gain, that we are too often prone to follow the path of least resistance. Along this line I wish to point out a real danger which we sometimes overlook, viz., too sweet a mixture. The best plan is to determine the sugar percentage in the mother's milk and then to keep the formula sweetness below this. The carbohydrate percentage may be added in a non-sweet form such as cream of wheat, cream of rice, rice flour or farina. For just as surely as the infant finds that he can get his milk sweeter or with less effort from the bottle, so will he follow the path of less resistance. He then becomes a lazy nurser.

Two very small points I would like to add to Tarr's excellent paper. First, that Dr. Abt's electric breast pump might well be placed in every pediatrician's office. Hardly a day passes but what some baby's milk supply should be analyzed. It goes without saying that the full breast should be completely emptied in the doctor's office by or under the supervision of a competent nurse. Second, that the pediatrician almost never gets the infant until the shortage of breast milk is apparent. Further in this connection, I would like to suggest that the time will undoubtedly come when the obstetrican will say to his patient, "I want you to decide upon the doctor that you are going to have for your baby, so that when baby arrives you can call him immediately." Then will we be able to stimulate breast-milk production to the best advantage.

DOCTOR TARR (closing)—This most excellent discussion of the subject convinces me that the vital matter of maternal nursing is not being completely left to the mother. It has been our experience that nursing mothers actually require most careful supervision. You cannot simply tell them to go home "and nurse their baby." The electric breast pump which Abt has given to us enables the attending physician to educate the mother, while she is still in her lying-in bed, along the proper lines of milk development. The warning sounded by Dr. Sharp is most timely and should be remembered whenever a formula is prepared for a nursing infant. Each day we listen to mothers who complain that since the baby was given a bottle, in addition to the breast, the breast has been slighted. I might add that the early giving of broth and well-seasoned soup stock to the nursing infant sometimes creates a disgust for food so bland as breast milk.

I wish to make my position absolutely clear regarding the matter of "expression." This procedure should never be relegated in favor of the pump Dr. Abt has devised or any other mechanical contrivance. The pump has now been modified in several respects, and hand-driven pumps are being made which sell for much less than the electrical pump. The rental plan may eventually be worked out, but the fact remains that each mother can take her two hands with her at all times, and when she has mastered the simple technique of "expression" she will have little need for a pump of any description. In the office of the pediatrician and in the maternity department of the hospital, the pump, in my opinion, can be used to best advantage. To insist that a mother, three or four days post-partem, should spend her energy in "expression after each nursing" does not appear logical to me. If a pump is not at hand, and if the services of a nurse are not to be had, the matter may safely be left until the mother is able to sit up comfortably.

Dr. Cowan is correct in his statement regarding my contention that breasts should be given added stimulation as soon as the baby is born. So far as I am aware, this

bold statement of mine has not appeared elsewhere, but my observations for the past several years and considerable experimental work have led me to the conclusion that the time to begin preparing the first meal for the baby is the day the mother becomes pregnant. We all encounter mothers to whom the act of nursing is decidedly repulsive. They cannot bear to have anything touch their nipples, and had their peculiar condition been studied and corrected during pregnancy, there would have been less to regret after the baby came. *There is but one way to insure the speedy solution of the infant-feeding problem. The family doctor delivers and directs the feeding of 85 per cent of all babies born. Let us detail him with a sane and practical plea that he teach all of his mothers the art of "expression" and when he has learned to talk breast milk to all of his mothers from the time they come for their first examination until the baby has a few teeth, then and only then may we hope, as pediatricians, to have time for a more careful study of some of the other preventive measures which must naturally occupy most of our attention. The family doctor should deliver babies and he should direct their feeding, but he should pay decidedly more attention to the matter of teaching preventive medicine to mothers than to the modification of cow's milk.* The electric breast pump can be used by him to wonderful advantage, and he will soon learn that breasts that are always emptied after a feeding will continue to function for a much longer time than those left quite to themselves. Dr. Scott has followed our work very carefully, and his conclusions agree with ours. The main thing is to *empty the breast.* In some instances the pump can scarcely be dispensed with, but "hand expression," routinely practiced, should be our constant teaching.

LENGTHENING THE QUADRICEPS TENDON FOR STIFF KNEE

By GEORGE J. MCCHESNEY, M. D., *San Francisco*

An operation entailing no risk to important structures, which presents no especial difficulties and will give a flexion range sufficient for all practical purposes in life, and which gets rid of an ugly tiring limp and a position of the limb which is always awkward and in the way, as in sitting in a street-car.

The operation requires three weeks in bed, after which the patient can be up and about on crutches, and would permit a return to light work within three months.

Pertinent discussion by Harold D. Barnard, Los Angeles; George Rothganger, Oakland; Leonard W. Ely, San Francisco.

THIS procedure, described first in the Journal of Orthopedic Surgery by Bennett in September, 1919, with two cases, and again in April, 1922, with six cases, has filled a long-felt want, particularly in industrial surgery. It does not seem to be as well known and popular as it should be, however, and hence, with an experience of five cases, I have ventured to come before you to plead its more frequent employment.

To briefly review the anatomy involved, we find the rectus femoris superficially and the crureus deeply in the midline, merging with the internal and external vasti, as they all come down to the patella. They unite so intimately in the lower third of the thigh, that pathological adhesions of one muscle cause restriction of motion in all, and that even, with adhesions in the upper third of the thigh, as occurred in two of my patients. The crureus is especially important, as it is in intimate contact with the bone in all its course. The question of the capsule naturally arises. My experience coincides with Bennett's. It can be disregarded, even the superior pouch. In all my patients there were soft, rustling tearings of capsular adhesions, as the joint flexed only after sufficient work was done upon the tendon. In no case was there an effusion or pain in the joint afterwards, and the capsular adhesions did not re-form. As Bennett says, the knee-joint adhesions are entirely comparable to the ankle-joint adhesions following a long-standing equinus deformity due to calf muscle contractures. The real pathology is then above the joint. Again, anatomically speaking, there are no important nerves or vessels in the operation area.

We are all acquainted with the stiff knees following fractured femurs, with sepsis, either operative or due to the initial trauma, and with the joint uninvolved. Knees will resist motion, however, when sepsis has been absent, but when operative procedures have caused adhesions of the muscle to the bone, or when prolonged immobilization and disuse of the quadriceps have caused a simple resistant contracture without operation, quite analogous to the calf muscle contractures causing a foot-drop deformity. In the latter condition, achillotomy, or, better, a lengthening operation is done as a routine, and the same should be done to the quadriceps and completely supplant the blind and dangerous attempt to manipulate the knee in an attempt to regain motion. We have then three general pathologic conditions, causing stiff knee.

First. Adhesions of muscle to bone, following sepsis, usually an osteomyelitis, mild or severe, complicating fracture.

Second. Adhesions of muscle to bone or to muscle, following operation, but with no sepsis.

Third. Resistant contracture of the quadriceps with no adhesions, due to prolonged immobilization, as for joint disease.

THE OPERATION

A long median incision is made from the patella up the thigh to the middle third. The lateral margins of the rectus and the capsule of the joint are exposed. The rectus and the crureus beneath are separated from the vasti by deep, lateral incisions connected above. The whole is dissected free from the femur, and remains attached to the patella only, like a tongue. If with moderate force the knee then does not flex, it means that the vasti are still holding and the lateral incisions must be deepened. Bennett does not emphasize this point, but I have found it very important. In my worst cases the vasti were cut laterally a staggering amount before the joint flexed with the rustling tear of intracapsular adhesions. When the joint flexes, the tongue of rectus and crureus is sutured with kangaroo, silk, or chromic gut (I prefer the latter) to the adjacent vasti, and the usual closure of the superficial tissues is made. When much lateral cutting of the vasti has been done, there are rather marked depressions or sulci, which will give rise to dead spaces unless pressure padding is made with the dressing to obliterate them.

The knee is put up in plaster, in a position of 90 or 100 degrees flexion for three weeks, after which the anterior half is cut away and gentle passive motion is made for a week, with splint replaced at night. In the fifth week active motion is begun, and increased in amount as time elapses. The cast should be worn at night for eight weeks altogether.